Rapeseed oil shelf-life evaluation by oxygen content determination using fluorescence quenching

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As oxidation is the shelf-life limiting factor in food susceptible to oxidation, it is important to monitor the oxidative changes during storage. In recent years a new method has been developed to measure the oxygen content in the atmosphere of packaging and indirectly the state of oxidation in packed products in a non-destructive way.

The aim of the present study was an attempt to use the oxygen determination method based on fluorescence quenching to evaluate the shelf-life of rapeseed oil. As a criterion of quality the peroxide value (PV) was used and then referred to oxygen loss.

The subjects of investigation were model samples of refined rapeseed oil stored in closed jars at 40 ºC, 50 ºC and 60 ºC under dark conditions. Set of the samples stored at 50 ºC filled with gas mixture (95%N_2+5%O_2) was also prepared. Periodically the samples were withdrawn to perform the measurements of oxygen content in the headspace and the analyses of hydroperoxides in the oil. The oxygen level was determined according to ASTM F2714-08 standard using OxySense® 325i system consisted of oxygen concentration analyzer and EasAlign™ pen with built in temperature sensor. Then the PV was measured by iodometric method according to EN ISO 3960:2010.

The results show that PV increased during storage of the samples. The presence of modified atmosphere retarded oxidation and extended the shelf-life. The lipid degradation observed during storage was accompanied by oxygen loss measured in the headspace. The relationship between PVs and headspace oxygen concentration fitted the polynomial models and depended on storage conditions. The fluorescence quenching method of oxygen determination may be a suitable tool for non-destructive quality evaluation of packed food products prone to oxidation. It can be the alternative for hitherto used invasive, time- and reagents-consuming methods of shelf-life measurement. Further investigation is advisable to fully understand the influence of storage conditions on oxygen loss in the package headspace.